

AMENDMENTS TO THE CLAIMS

1) (Canceled)

2) (Currently Amended) A process for employing the compound of Formula 1,  
(cation)(R'SO<sub>4</sub>)

**Formula 1**

comprising the step of: employing the compound as a solvent, or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; or employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit, wherein:

R' is selected from the group consisting of a linear or branched, saturated or unsaturated, aliphatic or alicyclic, functionalized or non-functionalized alkyl radical with 3-36 carbon atoms, wherein R' is optionally functionalized with one or more X groups; X is selected from the group consisting of an -OH, -OR'', -COOH, -COOR'', -NH<sub>2</sub>, -SO<sub>4</sub>, -F, -Cl, -Br, -I or -CN; and R'' is selected from the group consisting of a branched or linear hydrocarbon chain with 1 - 12 carbon atoms;

the compound has a melting point of less than 100° C; and

the cation is a nitrogen-containing cation selected from the group consisting of a quaternary ammonium cation with the general formula (NR<sub>1</sub>R<sub>2</sub>R<sub>3</sub>R)<sup>+</sup>, an imidazolium cation, a pyridinium cation, a pyrazolium cation, a phosphonium and a triazolium cation, wherein

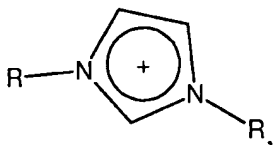
- a) the radicals R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> are selected independently at each occurrence from the group consisting of:
  - i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
  - ii) heteroaryl groups, heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the heteroaryl radical and at least one heteroatom selected from N, O and S which is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl groups and/or halogen atoms;
  - iii) aryl, aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or a halogen atom; and
- b) the radical R is selected from the group consisting of:
  - i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1

to 20 carbon atoms;

- ii) heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the aryl radical and at least one heteroatom selected from N, O and S, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom; and
- iii) aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom.

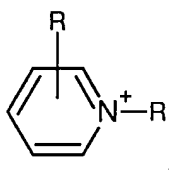
2.8) (Currently Amended) The process of claim 1, wherein the cation is selected from the group consisting of:

- a) quaternary ammonium cation with the general formula (NR<sub>1</sub>R<sub>2</sub>R<sub>3</sub>R)<sup>+</sup>;
- b) phosphonium cation with the general formula (PR<sub>1</sub>R<sub>2</sub>R<sub>3</sub>R)<sup>+</sup>;
- c) imidazolium cation with the general formula



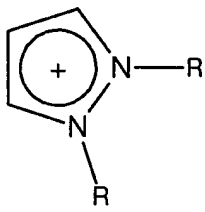
in which the imidazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group;

- d) pyridinium cation with the general formula



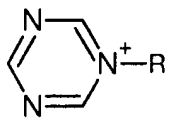
in which the pyridine core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group;

- e) pyrazolium cation with the general formula



in which the pyrazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group; and

f) triazolium cation with the general formula



in which the triazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group; wherein

g) the radicals R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> are selected independently at each occurrence from the group consisting of:

- i) ~~hydrogen~~;
- ii) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
- iii) heteroaryl groups, heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the heteroaryl radical and at least one heteroatom selected from N, O and S which is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl groups and/or halogen atoms;
- iv) aryl, aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or a halogen atom; and

h) the radical R is selected from the group consisting of:

- i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
- ii) heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the aryl radical and at least one heteroatom selected from N, O and S, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom; and
- iii) aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom.

3/4) (Previously Amended) The process of claim 2, wherein the anion has an empirical formula selected from the group consisting of C<sub>4</sub>H<sub>9</sub>SO<sub>4</sub>, C<sub>8</sub>H<sub>17</sub>SO<sub>4</sub> or C<sub>12</sub>H<sub>25</sub>SO<sub>4</sub>.

- 4) (Previously Amended) The process of claim <sup>1</sup>2, wherein the compound of the Formula 1 has a melting point of less than 75° C.
- 5) (Previously Amended) The process of claim <sup>1</sup>2, wherein the compound of the Formula 1 has a melting point of less than 50° C.
- 6) (Previously Amended) The process of claim <sup>1</sup>2, wherein (R'SO<sub>4</sub>) is an alkyl sulfate ester, wherein the alkyl moiety is selected from the group consisting of butyl, octyl, 2-ethylhexyl, and dodecyl; and the process comprises the step of: employing the compound as a solvent, solvent additive in a chemical process; employing the compound as an extraction solvent in a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or employing the compound as a phase transfer catalyst.
- 7) 8) (Previously Amended) The process of claim <sup>6</sup>7, wherein the cation is a nitrogen containing cation selected from the group consisting of 1-ethyl-3-methylimidazolium, 1-butyl-3-methylimidazolium butyl, 1-hexyl-3-methylimidazolium, 1-octyl-3-methylimidazolium, 1-decyl-3-methylimidazolium, 1-dodecyl-3-methylimidazolium, 1-butyl-pyridinium, trimethyldecylammonium, trioctylmethylammonium, trimethyldecylammonium, and trihexyltetradecylphosphonium.
- 8) (Previously Amended) The process of claim <sup>1</sup>2, wherein the cation is a nitrogen containing cation selected from the group consisting of 1-ethyl-3-methylimidazolium, 1-butyl-3-methylimidazolium butyl, 1-hexyl-3-methylimidazolium, 1-octyl-3-methylimidazolium, 1-decyl-3-methylimidazolium, 1-dodecyl-3-methylimidazolium, 1-butyl-pyridinium, trimethyldecylammonium, trioctylmethylammonium, trimethyldecylammonium, and trihexyltetradecylphosphonium; and the process comprises the step of: employing the compound as a solvent or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or employing the compound as a phase transfer catalyst.
- 9) 10) (Previously Amended) The process of claim <sup>1</sup>2, wherein the process is a reaction catalyzed by a transition metal; and the process further comprises the step of: employing the compound as a solvent or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or employing the compound as a phase transfer catalyst.

10 <sup>9</sup> 11) (Previously Amended) The process of claim 10, wherein the chemical process is selected from the group consisting of a hydroformylation reaction, a hydrogenation reaction, oligomerization reaction, esterification reaction, isomerization reaction and amide bond-forming reaction.

11 <sup>1</sup> 12) (Previously Amended) The process of claim 1, wherein the chemical process is a reaction catalyzed by an enzyme or biocatalyst; and the process further comprises the step of: employing the compound as a solvent, or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or employing the compound as a phase transfer catalyst.

12 <sup>11</sup> 13) (Previously Amended) The process of claim 12, wherein the chemical process is an oligomerization reaction, C-C bond-forming reaction, esterification reaction, isomerization reaction, or amide bond-forming reaction.

13 <sup>1</sup> 14) (Previously Amended) The process of claim 2, wherein the compound of the Formula 1 is substantially hydrolytically stable in neutral aqueous solution (pH = 7) up to 80° C.

14 <sup>1</sup> 15) (Previously Amended) The process of claim 2, wherein the compound of the Formula 1 has a melting point of less than 25° C.

15 <sup>1</sup> 16) (Previously Amended) The process of claim 2, wherein the compound is selected from the group consisting of:

- a) 1-ethyl-3-methylimidazolium butyl sulfate;
- b) 1-ethyl-3-methylimidazolium octyl sulfate;
- c) 1-ethyl-3-methylimidazolium 2-ethylhexyl sulfate;
- d) 1-ethyl-3-methylimidazolium dodecyl sulfate;
- e) 1-butyl-3-methylimidazolium butyl sulfate;
- f) 1-butyl-3-methylimidazolium octyl sulfate;
- g) 1-butyl-3-methylimidazolium 2-ethylhexyl sulfate;
- h) 1-butyl-3-methylimidazolium dodecyl sulfate;
- i) 1-hexyl-3-methylimidazolium butyl sulfate;
- j) 1-hexyl-3-methylimidazolium octyl sulfate;
- k) 1-hexyl-3-methylimidazolium 2-ethylhexyl sulfate;
- l) 1-hexyl-3-methylimidazolium dodecyl sulfate;

- m) 1-octyl-3-methylimidazolium butyl sulfate;
- n) 1-octyl-3-methylimidazolium octyl sulfate;
- o) 1-octyl-3-methylimidazolium 2-ethylhexyl sulfate;
- p) 1-octyl-3-methylimidazolium dodecyl sulfate;
- q) 1-decyl-3-methylimidazolium butyl sulfate;
- r) 1-decyl-3-methylimidazolium octyl sulfate;
- s) 1-decyl-3-methylimidazolium 2-ethylhexyl sulfate;
- t) 1-decyl-3-methylimidazolium dodecyl sulfate;
- u) 1-dodecyl-3-methylimidazolium butyl sulfate;
- v) 1-dodecyl-3-methylimidazolium octyl sulfate;
- w) 1-dodecyl-3-methylimidazolium 2-ethylhexyl sulfate;
- x) 1-dodecyl-3-methylimidazolium dodecyl sulfate;
- y) 1-butyl-pyridinium butyl sulfate;
- z) 1-butyl-pyridinium octyl sulfate;
- aa) 1-butyl-pyridinium 2-ethylhexyl sulfate;
- bb) 1-butyl-pyridinium dodecyl sulfate;
- cc) trimethyldecylammonium butyl sulfate;
- dd) trimethyldecylammonium 2-ethylhexyl sulfate;
- ee) trioctylmethylammonium butyl sulfate;
- ff) trioctylmethylammonium octyl sulfate;
- gg) trioctylmethylammonium 2-ethylhexyl sulfate;
- hh) trioctylmethylammonium dodecyl sulfate;
- ii) trimethyldecylammonium butyl sulfate;
- jj) trimethyldecylammonium octyl sulfate;
- kk) trihexyltetradecylphosphonium butyl sulfate;
- ll) trihexyltetradecylphosphonium octyl sulfate;
- mm) trihexyltetradecylphosphonium 2-ethylhexyl sulfate;
- nn) trihexyltetradecylphosphonium dodecyl sulfate; and the process comprises the step of:
  - employing the compound as a solvent or solvent additive in a chemical process;
  - employing the compound as an extraction solvent for a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or

16 employing the compound as a phase transfer catalyst.

17) (Currently Amended) A process for employing the compound of Formula 1

(cation)(R'SO<sub>4</sub>)

**Formula 1**

comprising the step of: employing the compound as a solvent, or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; or employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit, wherein:

R' is selected from the group consisting of a linear or branched, saturated or unsaturated, aliphatic or alicyclic, functionalized or non-functionalized alkyl radical with 3-36 carbon atoms, wherein R' is optionally functionalized with one or more X groups; X is selected from the group consisting of an -OH, -OR'', -COOH, -COOR'', -NH<sub>2</sub>, -SO<sub>4</sub>, -F, -Cl, -Br, -I or -CN; and R'' is selected from the group consisting of a branched or linear hydrocarbon chain with 1 - 12 carbon atoms;

the compound has a melting point of less than 100° C;

the cation is a nitrogen-containing cation selected from the group consisting of a quaternary ammonium cation with the general formula (NR<sub>1</sub>R<sub>2</sub>R<sub>3</sub>R)<sup>+</sup>, an imidazolium cation, a pyridinium cation, a pyrazolium cation, a phosphonium and a triazolium cation;

the compound of the Formula 1 is substantially hydrolytically stable in neutral aqueous solution (pH = 7) up to 80° C, and

a) the radicals R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> are selected independently at each occurrence from the group consisting of:

i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;

ii) heteroaryl groups, heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the heteroaryl radical and at least one heteroatom selected from N, O and S which is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl groups and/or halogen atoms;

iii) aryl, aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or a halogen atom; and

b) the radical R is selected from the group consisting of:

- i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
- ii) heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the aryl radical and at least one heteroatom selected from N, O and S, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom; and
- iii) aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom.

<sup>17</sup>  
~~18~~ (Previously Amended) The process of claim <sup>16</sup>~~17~~, wherein (R'SO<sub>4</sub>) has an empirical formula selected from the group consisting of C<sub>4</sub>H<sub>9</sub>SO<sub>4</sub>, C<sub>8</sub>H<sub>17</sub>SO<sub>4</sub> or C<sub>12</sub>H<sub>25</sub>SO<sub>4</sub>, and; the process comprises the step of: employing the compound as a solvent, solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit; or  
<sup>18</sup> employing the compound as a phase transfer catalyst.

~~19~~ (Currently Amended) A process for employing the compound of Formula 1  
(cation)(R'SO<sub>4</sub>)

**Formula 1**

comprising the step of: employing the compound as a solvent, or solvent additive in a chemical process; employing the compound as an extraction solvent for a material separation; or employing the compound as a heat carrier, or heat carrier additive in a heat exchange unit, wherein:

- a) (R'SO<sub>4</sub>) is an alkyl sulfate ester, wherein the alkyl moiety is selected from the group consisting of butyl, octyl, 2-ethylhexyl, and dodecyl;
- b) the cation is a nitrogen containing cation selected from the group consisting of 1-ethyl-3-methylimidazolium, 1-butyl-3-methylimidazolium butyl, 1-hexyl-3-methylimidazolium, 1-octyl-3-methylimidazolium, 1-decyl-3-methylimidazolium, 1-dodecyl-3-methylimidazolium, 1-butyl-pyridinium, trimethyldecylammonium, trioctylmethylammonium, trimethyldecylammonium, and trihexyltetradecylphosphonium;
- c) the compound has a melting point of less than 100° C; and
- d) the compound of the Formula 1 is substantially hydrolytically stable in neutral aqueous solution (pH = 7) up to 80° C.



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~~20~~ (Previously Amended) The process of claim ~~19~~<sup>18</sup>, wherein the process is a reaction catalyzed by a transition metal, and the reaction is a hydroformylation reaction, oligomerization reaction, esterification reaction, isomerization reaction or amide bond-forming reaction.

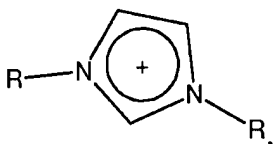
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~~21~~ (Previously Amended) The process of claim ~~19~~<sup>18</sup>, wherein the process is a reaction catalyzed by an enzyme or biocatalyst, and the reaction is an oligomerization reaction, C-C bond-forming reaction, esterification reaction, isomerization reaction, or amide bond-forming reaction.

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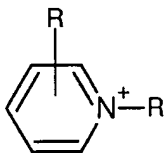
~~22~~ (Currently Amended) The process of claim ~~18~~<sup>17</sup>, wherein the cation is selected from the group consisting of:

- a) quaternary ammonium cation with the general formula  $(NR_1R_2R_3R)^+$ ;
- b) phosphonium cation with the general formula  $(PR_1R_2R_3R)^+$ ;
- c) imidazolium cation with the general formula



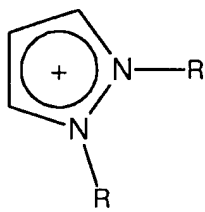
in which the imidazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group;

- d) pyridinium cation with the general formula



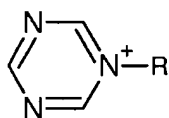
in which the pyridine core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group;

- e) pyrazolium cation with the general formula



in which the pyrazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group; and

f) triazolium cation with the general formula



in which the triazole core is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl group, C<sub>1</sub>-C<sub>6</sub> alkoxy group, C<sub>1</sub>-C<sub>6</sub> aminoalkyl group, C<sub>5</sub>-C<sub>12</sub> aryl group or C<sub>5</sub>-C<sub>12</sub>-aryl-C<sub>1</sub>-C<sub>6</sub> alkyl group; wherein

g) the radicals R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> are selected independently at each occurrence from the group consisting of:

- i) hydrogen;
- ii) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
- iii) heteroaryl groups, heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the heteroaryl radical and at least one heteroatom selected from N, O and S which is optionally substituted with at least one group selected from C<sub>1</sub>-C<sub>6</sub> alkyl groups and/or halogen atoms;
- iv) aryl, aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or a halogen atom; and

h) the radical R is selected from the group consisting of:

- i) linear or branched, saturated or unsaturated, aliphatic or alicyclic alkyl groups with 1 to 20 carbon atoms;
- ii) heteroaryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 3 to 8 carbon atoms in the aryl radical and at least one heteroatom selected from N, O and S, which is optionally substituted with at least

one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom; and

iii) aryl-C<sub>1</sub>-C<sub>6</sub> alkyl groups with 5 to 12 carbon atoms in the aryl radical, which is optionally substituted with at least one C<sub>1</sub>-C<sub>6</sub> alkyl group and/or halogen atom.